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GEOLOGY AND PALÆONTOLOGY.

ROMANOVSKY'S MATERIALEN ZUR GEOLOGIE VON TURKESTAN.—Scattered notes of the geology of Central Asia have from time to time been given in these pages, but M. Emm. de Margerie's *Compte-rendu de publications relatives à la Géologie de l'Asie et de l'Amérique* now gives us the opportunity to give a fuller account. MM. Mushketoff and Romanovsky, after having explored with great thoroughness the possessions of Russia in Central Asia, have published a part of their results. The first volume of M. Mushketoff's orographical and geological description of Turkestan appeared in 1886, while the first number of M. Romanovsky's *Materialen zur Geologie von Turkestan* was issued in 1880. M. Mushketoff considers the natural limits of Turkestan to be as follows: the Mougodjar mountains and the plateau of Ust-Urt to the west; the Tsungarian Ala-tau, the chains of the Tian-shan and the Pamir to the east; the Kopet-dagh and the mountains of Khorassan to the south; and the Tarbatagai, Zenghis-tau and the watershed between the Aral and the affluents of the Irtish to the north. The space comprised within these boundaries consists of two unequal parts, separated by the crest of the Kara-tau: the northern part, about one-third of the total area, corresponds to the basins of Lake Balkash and of other smaller lakes, while the larger southern part forms the Turan or basin of the Aral. The latter is divided by the Nura-tau into two portions: the basins of the Syr-daria and of the Amu-daria, the latter twice the size of the former. The reliefs of Turkestan pass from the N. E.—S. W. direction to that of N. W.—S. E. by insensible gradations, so that they form bundles of folds having their convexity turned towards the south, as in the chains of northern India. There are three principal groups of folds, the Tarbatagai, the summits of which do not pass 2500 metres; the Tian-shan in the centre, with summits reaching 5000 metres, and even 7300; and in the south the Pamir with a central crest reaching 4500 to 5000 metres, and with some summits of even 8000. Notwithstanding the diversity of the rocks that enter into its constitution, the Turanian basin presents a monotonous and but slightly varied geological structure, since Cretaceous, Tertiary, and post-tertiary deposits cover ninety-five per cent. of the surface, the older formations appearing only as masses here and there piercing the uniform mantle of modern sediments. Above the Palæozoic rocks, with a very noticeable uncomformity, lies a series of deposits with fossil plants, evidently a prolongation of the plant-bearing series of Afghanistan, and of the Gondwana group of Hindostan. During the Jurassic period the Turan formed a great island, extending far to the east, where scattered lagoons received sediments of small thickness; these sediments accumulated along the southern coast of the emerged land, but, as in Afghanistan, cover only a comparatively small area. Beds of lignite are abundant in the lower parts of the Trias-jura, as, for example, on the flanks of the Kara-tau and all around the Fergana basin, and in the absence of the true coal-measures, may prove of economical importance. The Jurassic is conformably covered by the Cretaceous and Tertiary beds, which reach a thickness of 650 metres in Fergana, and even 1600 in Hissar. These two series are so intimately linked that it is impossible to fix a precise line of demarcation between them, and both alike have been affected by dislocations which are well-marked near the mountains, but die out in the centre. The Cretaceous series comprehends very varied rocks, those of the plains differing much from those of the Tian-shan, where they consist chiefly of marls and limestones, the latter often shelly, but becoming oolitic and compact more to the east; the marls often enclose gypsum. It is in Fergana that the Cretaceous presents the greatest diversity of faces, but as fossils are rare and in poor condition, it is difficult to separate the series into stages.

GENERAL.—THE GEOLOGICAL STRUCTURE OF AFGHANISTAN. —M. Griesbach, Geologist of the Afghan Boundary Commission, has at various times published in the Records of the Geological Survey of India preliminary notes upon the geological structure of those portions of Afghanistan visited by him. These facts have been brought together by M. de Margerie in his *Compte-rendu de Publications relatives à la Géologie de l'Asie et de l'Amérique*, in such a manner as to give what appears a tolerably clear picture of the geological structure of this mountainous country. The principal crest of Afghanistan is formed by the Hindu-Kush and the Koh-i-Baba, the latter of which is continued into Persia, by chains running to the northwest. Although the greater part of the country is as yet geologically unexplored, the researches of M. Griesbach are sufficient to afford a good index to the character of the remainder. It thus appears that the palæozoic and older mesozoic rocks only come to the surface on the line of the main axis, the rest of the country being occupied mainly by cretaceous beds, often unconformable to the older mesozoic beds upon which they repose. Extensive surfaces in the north and west are covered by tertiary deposits. The region between the main chain of Afghanistan and the next most important series of elevations, viz., that which runs parallel to the Indus, is occupied by a number of anticlinal folds, crowded together in the region of Cabul, but spreading outwards fan-like as they approach the frontier of Persia. Most of the rivers found their present courses in miocene times, since which they have eroded deep ravines, while in the meantime the great anticlinal folds have become more accentuated. North of the main axis lie a series of parallel folds, narrow and lofty near the centre, but gradually spreading as they recede from it until they become broad and low undulations. The geological structure of Persia seems to be a continuation of that of Afghanistan. The oldest fossiliferous deposits as yet known belong to the Carboniferous system. Wherever examined, the Carboniferous outcrops are, like all the great bands extending from Armenia to the Himalaya, of marine origin. Above the Carboniferous beds lie a number of conformable deposits composed of marine beds alternating with littoral and fresh-water layers enclosing lignite and abundant remains of terrestrial plants. The exact classification of these beds has not yet been attempted, but they are surmounted conformably by undoubted Neocomian deposits, and their lower schistose portion is regarded by M. Griesbach as representing the Permian and Lower Trias; while Jurassic fossils have been discovered in the upper part. Great eruptive activity seems to have characterized the end of this series of littoral beds.

PALÆOZOIC.—E. N. S. Ringueberg (*Amer. Geol.*, May, 1888) gives reasons for considering the Niagara Transition Group as nearer to the Niagara than to the Clinton which underlies it, this affinity being determined by the increased number of Niagara molluscs found in it. The Niagara shales themselves can, upon palæontological evidence, be divided into three parts, each characterized by a regular upward decrease of the fossils. The lower third contains, with very few exceptions, all the species to be found throughout the entire group. A few valves of *Orthis lynx* have been found in the lowest third. The close of this lowest third is marked by a band characterized by the small crinoid *Homocrinus parvus*. *Hemicystites parasiticus*, parasitic upon *Spirifera niagarensis*, has not been found elsewhere by the author of the paper. The second and third divisions are chiefly defined by negative evidence, yet Homalonatus reaches its maximum size after leaving the Homocrinus band, and the few specimens of Cornulites and Stomatopora are mostly from within its borders, as is also the case with *Tentaculites niagarensis* and *Beyrichia spinosa* and *B. symmetrica*, which trio extends into the upper third. In the upper third corals are scarce, cephalopods almost entirely wanting, and crinoids excessively rare. *Rhynchonella neglecta* and *Streptorhynchus subplanum* are two of the most constant fossils, which attain their best development in this division.

Cœlosteus ferox is the name given by Prof. Newberry to a large species of fish, apparently allied to Dendrodus and Rhizodus, of which the jaws, teeth and bones were discovered in the Lower

Carboniferous Limestone at Alton, Ill. The lower jaw is about a foot long, an inch and a half wide in front, and widens to four inches behind. It is marked on the upper margin by a series of broad, shallow pits, for the insertion of few but large teeth. The jaws, as well as a large bone, probably a coracoid, consist of a thin shell of bone, enclosing a large area, which was doubtless occupied by cartilage. The dentary differs from that of Rhizodus in being entire.

Titanichthys clarkii Newb., discovered by Dr. W. Clark near Berea, O., exceeds in size even the *T. agassizii* of which drawings were exhibited at the meeting of the American Association at Montreal, 1882. The broadly triangular cranium measures five feet or more between the posterior lateral angles. It is concave behind, and the central part of the arch is marked by a broad depression as in Dinichthys. The condyle of the post-temporal bone is horizontal and broad, and is clasped in a furrow at the angle of the cranium. The post-temporals are a foot and a half wide, and, as in Dinichthys, are overlapped by the clavicles below and by the dorso-median plate above. This plate is sub-circular, and has a long, slender, furrowed process projecting backward and downward. The sub-orbital bones are eighteen inches long, the mandibles three feet. The posterior end of the mandible is spatulate, six inches wide, and turned upward; the anterior end is turned up like a sled-runner, and is excavated by a deep furrow somewhat as in *T. agassizii*, but the whole jaw is much heavier and broader. The under side of the body was protected by a triangular plate three feet long and nearly as broad, having a deep sinus posteriorly and a rounded projecting angle near the middle of either side.

MESOZOIC.—Mr. A. S. Woodward (*Quart. Jour. Geol. Soc.*, May, 1888) describes *Semionotus capensis* and *Cleithrolepis extoni*, both from the Stormberg Beds (Early Mesozoic) of the Orange Free State. The only species of Cleithrolepis before described, is *C. granulatus*, from the supposed Triassic Hawkesbury Beds of New South Wales. The South African specimens afford sufficient data to prove that the genus must be placed with the Dapediidæ.

A. Weithofer describes in the *Annals of the Naturhistorischen Hofmuseum of Vienna*, a new Dicynodont (*Dicynodon simocephalus*) from the Karroo formation of South Africa. The specimen is unfortunately only an imperfect half of the cranium, lacking the lower jaw, yet it offers characters which distinguish it from the species described by Owen. The parietal region is very highly developed, rising eleven centimetres, or more, above the line connecting the mastoid and the frontal, whereas in *D. pardiceps* Owen it only rises 5.5 cm. over the same level. The frontals are less developed than in *D. leonticeps*, the orbits are deeply sunk, and the nasal openings are placed far forward, so that it is one of the most peculiar representatives of the group. The entire occipital region and the bones of the under side are wanting.

J. S. Newberry (*Trans. N. Y. Acad. Sci.*, 1887) gives an account of the fauna and flora of the Trias of New Jersey and the Connecticut valley. About a hundred kinds of tracks of reptiles and amphibians have been found on the layers of sand which at one time fringed the triassic estuaries. These impressions vary from an inch to nearly two feet in length, and are for the most part three-toed, but in some cases are four- and five-toed. Alternating with the barren red sandstones and shales are some layers of dove-colored shale, which contain much organic matter, a few impressions of plants (of which thirteen species have been identified), and large numbers of the remains of fishes. All but two of the plants have been found in the Trias of Virginia and North Carolina. Prof. Fontaine has shown that the plants of the Richmond basin have greater affinity with those of the Rhaetic beds of Europe than with those of any other horizon, and has inferred that the southern extension of our Triassic rocks hold the same position in the geological scale.

The fishes of our Triassic strata belong to six genera, viz., Diplurus (1 sp.), Ischypterus (18 sp.), Catopterus (5 sp.), Ptycholepis (1 sp.), Acentrophorus (1 sp.) and Dictyopyge (1 sp.). Of these *Diplurus longicaudatus* Newb. was a large Cœlacanth, reaching a length of three feet, and is closely allied to Holophagus Egt., of the English Lias.

All the species are distinct from any known in the Old World, but a species of Ptycholepsis allied to ours is found in the Lias of Boll, Wurtemburg, and a species of Dictyopyge has been described from the Keuper of Germany. Catopterus seems to be distinct from any genus of fossil fishes found in the Old World, but Ischypterus is very near to Semionotus Ag., which is represented by species in both the Lias and Trias of Europe. Acentrophorus Traq. seems to differ from Ischypterus only in the absence of the spiny scales along the dorsal line. *A. chicopensis* is named from the Chicopee Falls, Mass., where it is found.

Geo. F. Becker (*Bull. Cal. Acad. Sci.*) replies to Messrs. Hague and Iddings' criticisms upon his conclusions respecting the pyroxenic rocks of Washoe. The former geologist sees in these rocks evidences of two separate eruptions, and therefore divides them into diabase and andesite, while the latter geologists consider both of these masses as substantially a single Tertiary eruption. Mr. Becker claims to have found additional reasons for maintaining the existence of diabase, and also for dividing the pyroxene andesite into two distinct outflows, separated by a long interval of time. At Steamboat Springs, about six miles from Virginia City, occurs an extensive series of sedimentary beds, nearly vertical, with a strike following the general direction of the Sierra. Andesites and basalts have broken through and overlie these beds, which are without trace of fossils, and are evidently pre-tertiary. Indeed, they appear to be as old as the rocks determined as Jura-Trias by the geologists of the fortieth parallel. These sedimentary beds contain pebbles of the exact character, both physically and mineralogically, with the east wall of the Comstock lode, determined by Becker as porphyritic diabase. The presence of these pebbles in beds of pre-tertiary age proves that there must be real pre-tertiary diabase somewhere in the neighborhood of Mt. Davidson. This locality is substantially in the same district as the Comstock lode, and, according to Mr. Becker's investigation of the faulting action on the Comstock, formerly received the drainage from the diabase area at Virginia.

The first number of Band xxxiv. of *Palæontographica* contains a description of some fossil remains of Chimæridæ in the Museum of Munich. These remains comprise some species of Ischyodus previously known, and also *Ischyodus ferrugineus*, nov. sp., and *Edaphodon kelheimensis*, nov. sp., as well as *Chimæropsis paradoxa* Zittel.

In the thirty-fourth part of *Palæontographica*, E. Holzapfel describes the molluscs of the Cretaceous of Aachen, prefacing his account with descriptions of the strata and lists of the species contained in each.

Dr. Rust (*Palæontographica*, Band xxxiv.) adds an important contribution, illustrated with eight plates, to the knowledge of the Radiolaria of the Cretaceous. Whilst in the Jura the oldest and newest beds are richer than the middle, in the Cretaceous the oldest stages are the richest. The Neocomian and Gault are especially rich. Out of a total of 165 species described in Dr. Rust's monograph, 59 are found in the Neocomian, 109 in the Gault, and only six in the upper stages of the system.

CÆNOZOIC.—Prof. J. Prestwich (*Quart. Jour. Geol. Soc.*) gives a table of the accepted classification of the Eocene series in England, Belgium, and the Paris basin, and states his reasons for some adverse conclusions. The sands and marls of Heers (Belgium) are usually considered as a separate horizon, but Prof. Prestwich points out that there is nothing in their molluscan fauna to warrant them as older than the Landenian, while the presence of sixty-two plants, all but one new and peculiar to the locality, may be simply due to the proximity of land. He objects also to the correlation of the Sables de Bracheux with the Lower Landenian and Thanet Sands, pointing that out of the eighty-two species of mollusca found in the Bracheux Sands only six seem to be common to the Thanet Sands and five to the Lower Landenian, while ten are found in the Woolwich beds. A table gives Prof. Prestwich's views upon these and other points in the correlation of these important beds of the London, Belgian and Parisian basins.

A. Weithofer has recently described several species of bats from the phosphorites of the central plateau of France, including Pseudorhinolophus, sp., *Alastor heliophigas.*, nov. gen. and sp., *Rhinolophus dubius,* Vespertiliavus, sp., Taphozous, sp., *Neoremantis adichaster,* nov. gen. and sp. Fossil Cheiroptera, like fossil birds, are rare.

A. Gaudry and Mar-Boule, in their third fascicule of *Matériaux pour l'histoire des temps Quartenaires,* call attention to the destruction of forests which resulted from the sands, clays and rocks brought down by the glaciers, forming a soil without vegetable humus, which even now is with difficulty made productive. What the moraines spared the cold completed, so that only herbage and shrubs could grow upon a soil which, as in the Siberian tundra, was frozen even during the summer at a certain depth. To meet this change in the character of the vegetation the type of the Rhinoceros was gradually modified into that of the Elasmotherium, which may be characterized as an intensely herbivorous Rhinoceros. The cranium of the Elasmotherium is larger than that of *Rhinoceros tichorhinus,* the example in the Museum of Paris measuring 98 centimetres in total length. The sinus of the frontal bones is developed into an enormous rugose protuberance, which probably supported a huge horn. The parietals take no part in the composition of this prominence, but are forced back by it, and are very much reduced. The nostrils are completely separated by a septum, and the nasals are narrow and smooth, showing that they did not bear a horn, as was the case in *R. tichorhinus.* The extremity of the intermaxillaries is largely developed, indicating the presence either of a proboscis, as in the tapir, or, as believed by our authors, of a prehensile lip. The twenty molars of Elasmotherium have longer crowns, and are much more complexly folded than those of any rhinoceros.